5/PRTS

09/673185

529 Rec'd PCT/PTC 12 OCT 2000

Title: "TAMPON"

The present invention refers to an internal absorbent, also known as a tampon, being particularly used for absorbing and holding vaginal exudes, such as menstrual blood and intermenstrual secretions.

Description of the prior art

Tampons, in general, are known from the prior art and usually comprise a body made of an absorbent material having a substantially cylindrical shape, suitable for introduction into the vaginal cavity. According to some references in the state of the art, a tampon may be cylindrical and curved, and the context of the present invention should be understood in this sense.

Usually, such tampons are provided with a cord projecting from one of its ends, which is intended to facilitate the removal of the tampon out of the vaginal cavity after its use.

As a rule, the absorbent body of tampons are made of absorbent fibers such as cotton fibers, and may include a superabsorbent material, in order to increase the efficiency of holding liquids in said absorbent body.

The absorbent body is manufactured from a substantially rectangular web of absorbent fibers, first transversely folded and then rolled up so as to form a cylindrical piece, still with the same consistency of the absorbent fibers.

The tampons from the prior art may also comprise a film of non-woven fabric superposed on one of the surfaces of the web of absorbent fibers, in order to involve the absorbent material and impart greater consistency to it, when said web is rolled up.

J&J 1796

Express Mail #EL568230076US
Date Mailed: Oct. 12, 2000

Before rolling up the absorbent web, the cord is interwoven at the fold of the web and remains interwoven with the web while the latter is being rolled up, thus remaining permanently fixed to the absorbent body.

Then, the absorbent body undergoes a radial compaction process, whereby the tampon is formed.

The compaction, described in patent documents such as US 3,422,496 and EP 422,660, is carried out by a press provided with multiple blades (also called "jaw"), which are radially arranged and apply force to the absorbent body containing the cord, thus compacting said body, providing longitudinal grooves in this body and forming the tampon.

The material presently used in manufacturing the cord, typically cotton, has low elasticity and may be cut during the process of compacting the absorbent body with said blades.

That is to say, the cord may be damaged when the compaction of the absorbent material occurs in conjunction with said cord, and the force applied by the blades to said absorbent material is transferred to the cord, which might break or weaken the filaments of this cord, resulting in a failure of the product.

In spite of the very low probability of this problem occurring, the great drawback is that this damage or cut is not detected before the need for using the cord, that is, at the time of removing the tampon from the vaginal cavity.

Objective of the Invention

One of the objectives of the present invention is to provide a tampon with an elastic or extensible cord that will not be broken or damaged at the time of compacting the absorbent body, replacing the cotton cord, which has been used lately. This objective is achieved by means of a tampon, particularly a tampon for holding vaginal exudates, which comprises a substantially cylindrical absorbent body, preferably provided with longitudinal grooves in its surface and comprising a cord associated to the absorbent body, suitable for handling said tampon, the cord comprising synthetic fibers, preferably textured (crimped).

As used herein, an "elastic cord" is one provided with a higher or lower degree of property of quickly tending to return to its original dimensions, after removal of the force that is causing its elastic deformation. An "extensible cord" is one provided with the property

of extending or elongating without substantially permanent plastic deformation under application of a specific force. The cord of the invention may be either elastic or extensible without being elastic.

A further objective of the present invention is to provide a method of manufacturing a tampon using an extensible or elastic cord that will replace the cotton cord used at present. This objective is achieved by means of a method of manufacturing a tampon, particularly a tampon for holding vaginal exudates, comprising a substantially cylindrical absorbent body provided with longitudinal grooves in its surface and comprising a cord suitable for handling said tampon, associated with the absorbent body, the method comprising the steps of cutting a substantially rectangular portion of a web of an absorbent material, folding the absorbent web, interweaving the cord at the folded end of the web, rolling up the web to form the absorbent body, compacting the absorbent body by means of blades of a press, the cord being textured. Preferably, the process of the present invention involves a step of superposing a non-woven material on a surface of the web of absorbent material, after the step of cutting a substantially rectangular portion of said web of absorbent material.

The tampon cord of the present invention preferably comprises textured synthetic fibers. The textured fibers and/or the cord when tested for tensile strength and elongation properties, such as by the standardised test methods ASTM D-2256 and D-3822, exhibit a multi-phase, tensile stress-strain curve having an inflection point between a first and second phase. A typical stress-strain curve is a plot of the amount of stress applied to the material versus the amount of strain the material is undergoing. "Stress" is defined as force per unit original area, while "strain" is the amount of elongation over the original length. The slope of the stress-strain curve in the linear region of the plot is a measure of the material's elasticity. The slope measurement is referred to as "Young's modulus".

During the first phase, the fibers are extended, or "straightened out". That is, texture is removed from the fibers. There is considerable strain or elongation under a relatively low amount of stress, thus providing a first Young's modulus value. The second phase begins after the fibers are totally extended. In the second phase, a much greater amount of force is required to elongate the fibers. The material in the second phase will undergo a limited amount of elongation without permanent (plastic) deformation. Once the yield point, or point wherein deformation transitions from elastic deformation to plastic deformation, is reached, the elongation will be permanent and will alter the cross-sectional area of the ma-

terial. The second phase provides a second Young's modulus, which is greater than the first Young's modulus.

Synthetic fibers of similar chemical make-up in the absence of any texture will typically exhibit only a single-phase stress-strain curve that substantially corresponds to the second phase, as described above. Thus, one effect of the texture is to allow the material to be extended a much greater extent prior to undergoing plastic deformation, to a point of material failure.

Preferably, the material used in manufacturing the cord is polypropylene, polyester or nylon fibers or mixtures thereof, these fibers being subjected to a texturing process.

The texturing process is a physical-chemical treatment applied to threads of synthetic continuous fibers. This treatment aims at modifying the aspect, characteristics and properties of the fibers, usually causing them to be more elastic or extensible, due, partly or totally, to the fixation of folds or curves along the length of the fibers, for instance by means of heat. In other words, the linearity of the fibers is altered in a substantially permanent way.

Those skilled in the art know how to chose the process for obtaining texturing of fibers. Among the texturing processes known from the prior art, generically described in the literature of textile technology, the following can be pointed out: the continuous process, the false twist process, the modified false twist process, the process with a press-down chamber, the "spunize" process, the process with metallic blade, the "crinkle" process, the stuffer box process, the sterical buckling process and the air-blow process.

The fibers used to make the cord of the invention may be manufactured by any of the above processes, the air-blow process being the preferred one, which consists in interweaving the fibers at a high speed under application of hot or cold air to the fibers, the latter having been previously wetted with hot water.

The cord of the invention is composed of a set of fibers, preferably a set of cables of twisted fibers which, in turn, are joined together to compose the cord. Preferably, the number of fibers per cable ranges between about 30 and about 200. Preferably, the number of cables to form the cord ranges between about 8 and about 25, more preferably, about 12; preferably, the number of twist of the cables ranges between about 50 and about 250, more preferably, about 120; preferably the cables have dtex ranging between about 100 and about 200 (dtex being the weight in grams of 10,000 meters of cable).

The cord of the invention exhibits an elastic or non-elastic extensibility (calculated as the difference between the final length and the initial length divided by 100) higher than about 25%, preferably between about 30% and about 200, and more preferably between about 40% and about 60%.

In a preferred embodiment of the present invention, the cord is provided with a partly or totally fluid-repelling characteristic, for instance, by dipping it into a bath of a hydrophobic or fluid-repelling substance. This characteristic aims at preventing the blood absorbed by the tampon from contacting the cord, which would convey to the wearer a feeling of moisture and a little attractive visual aspect. It may also be dyed to a desired color.

Description of the Drawings

The present invention will now be described in greater detail with reference to an embodiment represented in the drawings. The accompanying figures have been made purposely without exact measures or proportions, because they are given by way of example.

Figure 1 is a perspective view of the tampon and cord according to the present invention.

Figure 2 is a view of a step of manufacturing the tampon after one folding of the web.

Figure 3 is a view of another step of manufacturing the tampon illustrated in figure 1, prior to the process of pressing the web, after rolling it up.

Figure 4 is a simplified representation of the press used for compacting the absorbent body when the compacting blades are open.

Figure 5 is a simplified representation of the press used for compacting the absorbent body when the compacting blades are closed.

Figure 6 is a view of the web of the tampon shown in figure 1, open after pressing; and

Figure 7 is a graph of the behavior of materials subjected to deformation.

Detailed Description of the Figures

As can be seen from figure 1, the tampon 1 comprises a substantially cylindrical absorbent body 3 having longitudinal grooves 4 in its surfaces and comprising a cord 5. The end 2 is substantially rounded or ogival in shape.

As known from the prior art, the absorbent body 3 is manufactured from a web of an absorbent material, for instance, cotton fibers mixed with rayon fibers cut with dimensions of approximately of 235 mm long and 50 mm broad, forming an absorbent web 10.

A film of non-woven material 11 is superposed on one of the surfaces of the web 10, as can be seen from figures 2 and 3. The film 11 is longer than the length of the absorbent body 3.

During the process of manufacturing the web 10, the latter is asymmetrically folded over itself, as shown in figure 2. The cord 5 is interwoven in the fold D of the web 10, and the ends of this cord are fixed with a knot 6.

Then, the web 10 is rolled up to form an absorbent body 3, as illustrated in figure 3. The part of the film 11 longer than the length of the absorbent body 3 is used to overlap the outer surface of the body 3, maintaining the web 10 rolled-up.

The absorbent body 3 is then passed through a press 40 and is compressed in order to mold the material into a cylindrical-ogival shape. Preferably, the end 2 of the tampon 1 is molded as an ogive, so that the tampon will have a rounded end, which facilitates its introduction into the vaginal cavity. The cord 5 projects from the opposite end of the tampon 1, as shown in figure 1.

The absorbent body 3 in conjunction with the cord 5 is then subjected to compaction.

As illustrated in figures 4 and 5, the press 40 is provided with a plurality of blades 41, which are moved radially towards the center of the press 40 (see figure 5), thus compressing the surface of the absorbent body 3, which remains with grooves 4 arranged longitudinally at the place where said blades 41 contact said absorbent body 3.

Thus, the cord 5 used at present might be damaged or even broken, in which case the tampon would be defective. As shown in figure 6, which illustrates a tampon 1, which has been unfolded after the pressing step, the cord 5 is capable of receiving higher

pressures, extending at the points 20, that is to say, in the regions where the blades 41 of the press 40 penetrate more deeply.

Thus, according to a preferred embodiment of the present invention, the cord 5 used at present is manufactured with a textured fiber that bears, without breaking, forces (stress) applied to the absorbent body 3 by said blades 41 of the press 40.

The use of a textured fiber in manufacturing the cord 5 prevents the latter from breaking during the process of pressing the absorbent body 3, since such a material enables the cord 5 to elongate and get molded according to the deformation caused on said body 3 by the blades 41 of the press 40.

A stress-strain curve of a cord of the present invention is illustrated in Figure 7. An introductory phase, a first phase, and second phase are separated in the vicinity of points P1 and P2, respectively. The first phase yields considerable elongation with limited amount of applied stress, thus exhibiting a relatively small first Young's modulus E1. The second phase has a much steeper linear range, providing a second Young's modulus E2 that is greater than E1. The first phase predominantly alters the material by removing texture therefrom. Therefore, material not having such texture would exhibit only a single-phase stress-strain curve similar to that shown in curve "1" having a Young's modulus corresponding substantially to E2. This cord would have a lesser amount of elongation prior to material failure.

A preferred embodiment of the invention having been described, one should understand that the scope of the present invention embraces all possible variations and is only limited by the contents of the claims, including the possible equivalents.